Optical properties of smoke aerosol over Los Alamos, NM, derived from AERONET

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Significant amounts of atmospheric aerosols are annually generated from wildfires and biomass burning events. Smoke aerosol, from biomass combustion, is a leading source of natural and anthropogenic pollution affecting Earth's radiation budget. Recent improvements in the detailed knowledge of smoke aerosol optical properties have reduced uncertainties in the role of biomass burning on climate forcing. The increase in smoke aerosol knowledge has been largely advanced with data acquired through the global robotic network of AERONET (http://aeronet.gsfc.nasa.gov/index.html) sun/sky radiometers. Previous studies using AERONET data have revealed variability in smoke aerosol properties generated from different biomes throughout the world. Here we present AERONET measurements over Los Alamos, New Mexico to assess the influence of smoke aerosol over a region where seasonal variations in biomass burning occur regularly and research on smoke aerosol properties has remained minimal.

During June of 2005, a series of wildfires resulted in heavy aerosol loading throughout the Southwestern United States. Significant variations in aerosol optical thickness were observed during this period over the Los Alamos AERONET site (35.87 N, 106.33 W). Computed back trajectories using the Hybrid Single Particle Lagrangian Integrated Trajectory (HYSPLIT) model (https://www.arl.noaa.gov/ready/hysplit4.html) revealed advection of smoke aerosol from fire sites in Arizona, Nevada, Utah, and New Mexico. Aerosol optical depth, size distribution, and single scattering albedo measurements from AERONET at Los Alamos were analyzed for this period and compared to periods not dominated by the presence of smoke aerosol. Results indicated that the influence of smoke aerosol increased aerosol optical thickness by a factor of five at 440nm, and resulted in bimodal size distributions dominated by fine mode accumulation particles. Single scattering albedo values were typically .95 on days dominated by smoke aerosol. Relationships among single scattering albedo and size distributions will be further discussed.

Additional information relating to this project can be found at: https://aerosol.lanl.gov/